

**In the Claims:**

1. (Currently Amended) A system for automatic online optimization of a process having an input -space comprising input boundaries from a system-initiated empirical model, the system comprising:

a measurement unit for measuring outputs of the process at points of the input space;

a -selector, for selecting points of the input space such as to maximize information about the input space from a predetermined number of said points, at which to carry out measurements, wherein said selected points are orthogonally arranged in the input space within which the process is operable;

a controller being operable to control said process to produce respective measured outputs at ones of selected points, and

a regressor for using said measured outputs to obtain a predictive model of the process configured to produce predicted outputs over the input space by regression from said measured outputs, the controller subsequently using said predictive model to provide online optimization of said process.

2. (Previously Presented) A system according to claim 1, wherein said predictive model comprises a first formula describing the process.

3. (Previously Presented) A system according to claim 2, wherein said points comprise at least input boundaries of the process.

4. (Previously Presented) A system according to claim 3, wherein said points comprise further desired points across the input space.

5. (Previously Presented) A system according to claim 4, wherein said points are definable by a geometric spacing across the input space.

6. (Previously Presented) A system according to claim 5, wherein said geometric spacing is selectable to give an even spread of points across the input space.

7. (Original) A system according to claim 5, wherein said geometric spacing is selectable to cover at least the input boundaries and a center of the input space.

8. (Original) A system according to claim 5, wherein said geometric spacing is in accordance with DOE predetermined placing rules.

9. (Previously Presented) A system according to claim 2, wherein said predictive model is selected from the group consisting of a linear formula, a linear formula with interaction between inputs, a quadratic formula and a quadratic formula with interaction between inputs.

10. (Previously Presented) A system according to claim 1, wherein the input space is divisible into discrete regions;

wherein said predictive model comprises predicted outputs associated with each discrete region; and

wherein said predictive model is configured to return, for a given discrete region, both said predicted outputs and actual outputs measured for said given discrete region when the continuous process is running, thus improving the quality of outputs returned.

11. and 12. (Canceled).

13. (Previously Presented) A system according to claim 1, further having an empirical results quantity assessor for interchanging predicted outputs with actual outputs when said actual outputs are assessed to be statistically significant according to at least one predetermined criterion of significance.

14. (Previously Presented) A system according to claim 1, having a prediction quality assessor for interchanging said actual outputs with said predicted outputs when said predicted outputs are assessed to diverge significantly from an outcome of the process according to at least one predetermined criterion of significance.

15. (Currently Amended) A system for automatic online optimization of a process using a system-initiated model, comprising:

~~A a model-based controller;~~

a process model using data, said data including inputs and correspondingly mapped predictive outputs, the model configured with a process control unit to optimize a process by selecting inputs mapped on to a desired output and to set said inputs as operating points for said process, wherein said operating points are orthogonally spaced in an input space within which the process is operable;

a data model for generating data for said process model; and

an empirical data extractor for extracting empirical data from the process for insertion into said ~~model-based controller~~;

wherein said process model is configured to use said generated data and said empirical data interchangeably in order to carry out online optimization of said process.

16. (Previously Presented) A system according to claim 15, further comprising a prediction quality assessor for interchanging results obtained by said extractor with results obtained from said data model when a prediction of said process model is assessed to diverge significantly from an outcome of the process according to at least one predetermined criterion of significance.

17. (Previously Presented) A system according to claim 15, further comprising an empirical results quantity assessor for interchanging results produced by said data model with results obtained by said extractor when results obtained from running the process are assessed to be statistically significant according to at least one predetermined criterion of significance.

18. (Original) A system according to claim 15, wherein said process model is a lookup table.

19. (Previously Presented) A system according to claim 18 wherein said lookup table comprises output values for discrete regions of an input space within which the process is operable.

20. (Currently Amended) A system according to claim 15, wherein said data model is a formula obtainable from outputs of the process associated with said ~~orthogonallygeometrically~~ spaced points ~~of an input space within which the process is~~ operable.

21. (Previously Presented) A system according to claim 20, wherein said formula is selected from the group consisting of a linear formula, a linear formula with interactions, a quadratic formula and a quadratic formula with interactions.

22. (Currently Amended) A system according to claim ~~20~~15, wherein said ~~orthogonallygeometrically~~ spaced points are evenly distributable about said input space.

23. (Currently Amended) A system according to claim ~~20~~15, wherein said ~~orthogonallygeometrically~~ spaced points comprise points placed on the boundaries of said input space and a point placed at a center of said input space.

24. (Currently Amended) A method of automatic online optimization of a process, using an empirical model, said empirical process model connecting process inputs with predicted process outputs, the method comprising the steps of

generating data from experimental operation of the process for the process model using a data generation formula; and

carrying out online optimization of the process using said generated data within the process model by setting inputs in accordance with a desired output;

and

wherein the process inputs lie within an input space and said data is obtained by said experimental operation of the process, said experimental operation comprising running the process at preselected points in said input space; and

wherein said preselected points are orthogonally placed in said input space using said data generation formula.

25. and 26. (Canceled).

27. (Previously Presented) A method according to claim 24, wherein said preselected points are evenly spaced in said input space.

28. (Previously Presented) A method according to claim 24, wherein at least some of said preselected points are placed at boundaries and a center of said input space.

29. (Original) A method according to claim 24, further comprising a step of replacing said generated data with data empirically obtained during the running of the process.

30. (Previously Presented) A method according to claim 29, wherein said step of replacing said generated data is carried out when said empirically obtained data has reached a threshold of significance according to at least one predetermined significance criterion.

31. (Previously Presented) A method according to claim 29 further comprising a step of reverting to said generated data using a data generation formula.

32. (Previously Presented) A method according to claim 31, wherein said step of reverting is carried out when results predicted by the data-based process model are detected to diverge from empirically measured process results by an amount exceeding a threshold of significance according to at least one predetermined significance criterion.

33. (Currently Amended) A method according to claim ~~14~~ 24, comprising the steps of  
building a formula for a first input space,  
obtaining process output data for said first input space,  
building a formula for a second input space,  
obtaining process output data for said second input space,  
comparing said process output data for said second input space with process output data for said first input space,  
on the basis of said comparison selecting a third input space for obtaining process output data,  
and operating said process in an optimal one of said input spaces.